Sea-Level Rise and Tax-Base Vulnerability: A Parcel and Road-Network Analysis for South Jersey

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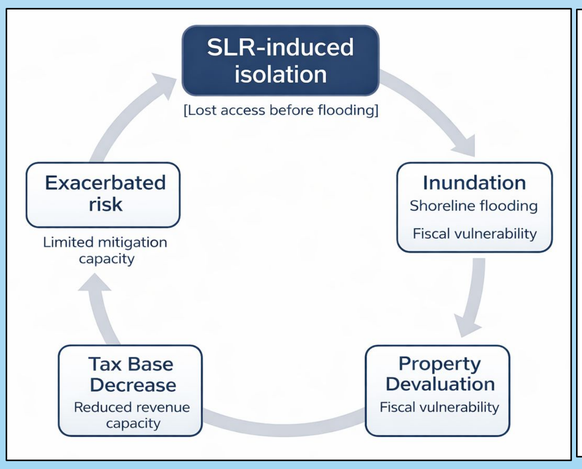
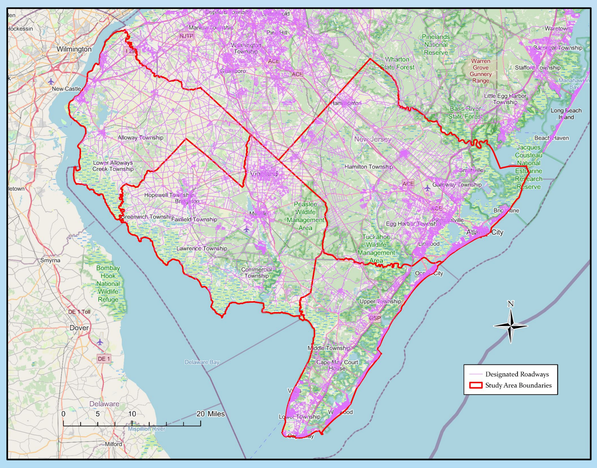
Introduction

As identified in the New Jersey Scientific Report on Climate Change, sea-levels are increasing at a greater rate in New Jersey than other parts of the world. Sea-level rise (SLR) and coastal flooding threaten local fiscal stability, not just physical assets, because disruption and displacement can reduce property values as recovery needs grow. As flooding expands, parcels can shift from occasional impacts to repeated access disruption and longer term devaluation. This project links parcel scale sea level rise exposure with local economic conditions across four counties in South Jersey to identify where fiscal and planning challenges may emerge first.



SLR can accelerate property devaluation, threats the tax base that funds mitigation and reinforces fiscal vulnerability over time. Before a house is flooded, disruption of road access can create isolation when road segments are overtopped and parcels are cut off from critical services, leading to earlier tax base risk. This study measures the spatial and temporal pattern of this risk.

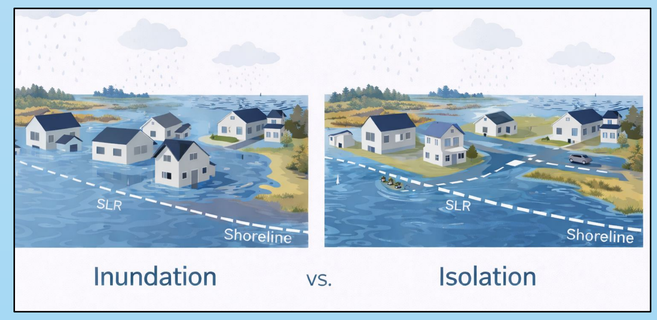


Designated roadways used to assess isolation risk within the South Jersey study area.

Sunny day flooding threatens New Jersey communities. Photo Credit: New Jersey Department of Environmental Protection (NJDEP)

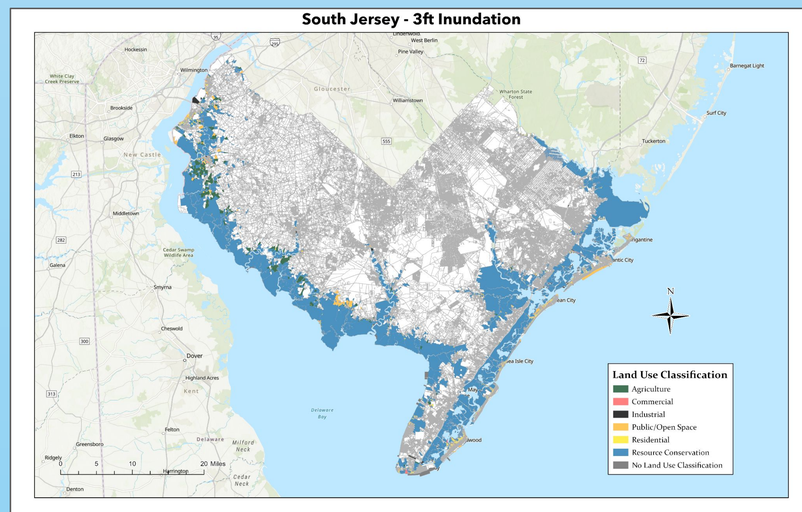
Data Sources

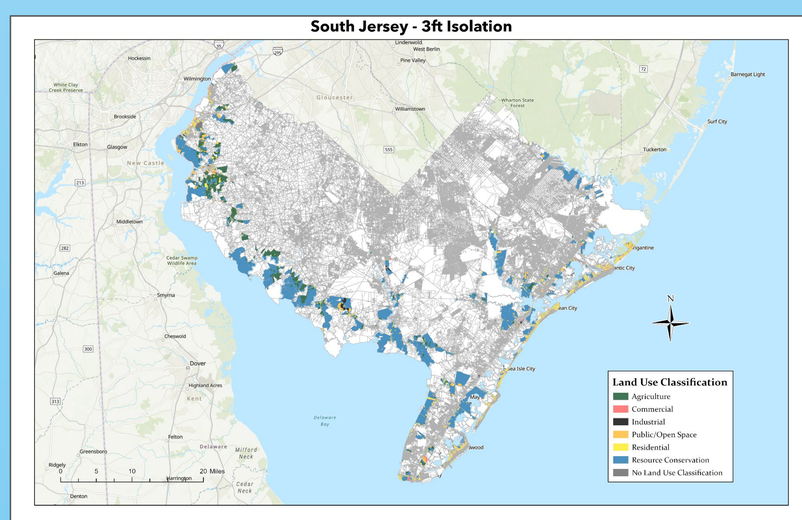
- National Oceanic and Atmospheric Administration (NOAA) Mean Higher High Water (MHHW) Sea-Level Rise Scenarios, 1-10 ft projections
- New Jersey 2020 LU/LC (2024) from New Jersey Geographic Information Network (NJGIN)
- County parcels and assessments from ParcelAtlas
- Road networks from New Jersey Geographic Information Network (NJGIN)



County	SLR (Ft)	Value ($M) - INU	% Tax Base - INU	Value ($M) - ISO	% Tax Base - ISO
Atlantic	1	613.62	1.64	432.64	1.16
	2	814.31	2.18	2,455.58	6.57
	3	1,940.45	5.19	7,948.71	21.26
	4	4,863.82	13.01	11,822.54	31.63
	5	7,842.71	20.98	13,940.80	37.29
	6	11,992.45	32.08	15,694.37	41.98
	7	15,160.96	40.56	15,864.77	42.44
	8	16,877.76	45.15	16,057.07	42.95
	9	17,887.33	47.85	16,369.20	43.79
	10	18,176.77	48.62	16,466.82	44.05
Cape May	1	580.68	1.14	1,861.93	3.67
	2	1,675.61	3.30	6,047.99	11.92
	3	6,853.43	13.51	20,822.60	41.05
	4	14,629.08	28.84	35,215.02	69.42
	5	22,750.99	44.85	39,014.17	76.91
	6	30,860.22	60.84	39,393.36	77.66
	7	36,971.26	72.89	40,047.21	78.95
	8	40,292.35	79.43	41,312.44	81.44
	9	42,263.86	83.32	41,689.26	82.19
	10	43,255.74	85.28	42,278.76	83.35
Cumberland	1	101.75	0.96	134.20	1.27
	2	153.56	1.45	192.06	1.82
	3	208.71	1.98	261.67	2.48
	4	274.82	2.60	366.75	3.47
	5	340.06	3.22	463.57	4.39
	6	509.16	4.82	509.11	4.82
	7	566.87	5.37	615.81	5.83
	8	646.29	6.12	632.97	5.99
	9	693.98	6.57	672.37	6.37
	10	738.74	7.00	727.18	6.89
Salem	1	104.38	1.65	399.82	6.32
	2	415.81	6.57	651.97	10.31
	3	602.31	9.52	1,040.02	16.44
	4	881.17	13.93	1,422.99	22.49
	5	1,114.43	17.62	1,748.03	27.63
	6	1,377.29	21.77	1,921.31	30.37
	7	1,594.74	25.21	1,994.82	31.53
	8	1,956.99	30.93	2,077.77	32.84
	9	2,126.78	33.62	2,200.40	34.78
	10	2,328.86	36.81	2,859.05	45.19

Table 1: Comparison of inundation and isolation estimates across four counties, including the percent of the property tax base impacted.

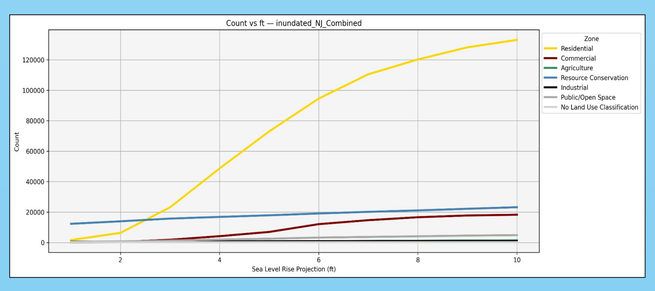


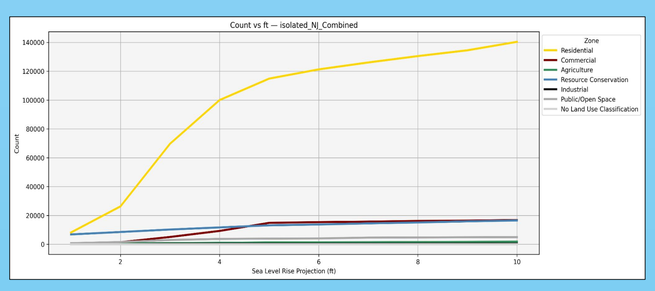


Maps above show South Jersey parcel risk exposure at 3 ft SLR; Figures on right indicate isolation affect residential land use sooner and with greater magnitude than inundation risk across SLRs.

Methods

- Study Area: Atlantic, Cape May, Cumberland, and Salem Counties in New Jersey
- Land-use classification: NJ 2020 LU/LC data were aggregated to broad classifications (Residential, Commercial, Industrial, Agriculture, Resource Conservation, and Public/Open Space)
- Parcel Base: parcel polygons with flooding scenario exposure assigned using parcel centroids for all spatial joins
  - *Inundation Exposure*: Centroid intersects SLR inundation footprint (by scenario)
  - *Isolation Exposure:* Centroid remains dry but loses functional road-based access due to roadway disruption under the same SLR scenario





Key Findings

- Isolation expands exposure beyond inundation, with the largest divergence at low-mid SLR (~1-6 ft)
- Atlantic and Cape May drive the strongest early tax-base impacts under both models
- Cumberland's tax-base exposure remains low across scenarios (single digit percents), with much of the impacted footprint in Resource Conservation areas
- Salem shows moderate but steady increases
- Isolation identifies "dry-but-disconnected" parcels outside inundation footprints
- Inundation-only screening can understate human disruption and fiscal vulnerability by missing road-access loss

Next Steps

- Apply the same parcel inundation + road-isolation framework to Maryland's Eastern Shore (nine counties) to support a border regional comparison beyond this NJ-focused poster
- Address cross-state comparability limits: NJ and MD zoning, parcel, assessment, and land-use systems differ substantially, so results require normalization rather than harmonization
- Refine normalization approaches (e.g. % tax base, common land-use groupings, sensitivity checks) to improve interpretability across jurisdictions
- **Ongoing outreach:** an active survey of NJ, MD, and DE coastal resilience and planning professionals to document what strategies are working, what is not, and where implementation gaps remain

References

He, Q., Namadi, S., & Olcese, S. (in progress).Beyond Inundation: Spatial and Temporal Analyses of Local Fiscal Stress under Sea-Level Rise and Coastal Flooding.

Best, K., He, Q., Reilly, A.C. et al. Demographics and risk of isolation due to sea level rise in the United States. Nature Communication. 14, 7904 (2023). https://doi.org/10.1038/s41467-023-43835-6

Hino, M., & Burke, M. (2021). The effect of information about climate risk on property values. *Proceedings of the National Academy of Sciences - PNAS*, *118*(17), Article e2003374118. https://doi.org/10.1073/pnas.2003374118

Logan, T.M., Anderson, M.J. & Reilly, A.C. Risk of isolation increases the expected burden from sea-level rise. Nature Climate Change. 13, 397–402 (2023). https://doi.org/10.1038/s41558-023-01642-3

Shi, L., & Varuzzo, A. M. (2020). Surging seas, rising fiscal stress: Exploring municipal fiscal vulnerability to climate change. *Cities*, *100*, Article 102658. https://doi.org/10.1016/j.cities.2020.102658

Acknowledgments

This research was supported by the National Science Foundation (NSF) under Award No. 2427242 through the Directorate for Engineering, Division of Civil, Mechanical, and Manufacturing Innovation (CMMI). The authors gratefully acknowledge this support, as well as the institutional and academic environment at Rowan University that made this work possible. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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